WHAT IS CLAIMED IS:

1. A solid-state imaging device, comprising:

a pixel array including a plurality of unit pixels, each of the unit pixels including a photo diode and an insulated gate field effect transistor that detects photocharges; and

a control circuit that controls an operation of the pixel array, wherein:

the photo diode and the insulated gate field effect transistor share a well region of a first conductivity type that is formed in a semiconductor layer of a second conductivity type, the semiconductor layer of the second conductivity type being formed on a semiconductor substrate of the first conductivity type;

the insulated gate field effect transistor comprises:

a source diffused region of the second conductivity type formed on a surface of the well region;

a drain diffused region of the second conductivity type formed on a surface of the semiconductor layer other than the surface of the well region;

a gate electrode formed above the well region between the drain diffused region and the source diffused region with a gate insulating film therebetween;

a channel region formed in the surface of the well region below the gate electrode and having an impurity layer of the second conductivity type; and

a heavily doped buried layer of the first conductivity type formed below the channel region in the well region and adjacent to the source diffused region, having an impurity concentration higher than that of the well region, and being an accumulation region that accumulates charges of a given conductivity type generated in response to light incident on the photo diode;

the control circuit comprises a drain control circuit providing any of constant voltage, a constant current, and constant charges to the drain diffused region; and

the control circuit previously forward biases a junction region between the semiconductor substrate and the semiconductor layer by the any of the constant voltage, the constant current, and the constant charges, that is provided from the drain control circuit to the drain diffused region, so as to accumulate a predetermined amount of the charges of the given conductivity type in the accumulation region, and the charges of a given conductivity type accumulated in the accumulation region being discharged thereafter.

2. The solid-state imaging device according to claim 1,

the drain control circuit comprising a dummy diode with a junction region between the semiconductor substrate and the semiconductor layer included in a dummy pixel that has a same structure as the structure of the unit pixel, and a constant current source providing a forward current to the dummy diode; and

the drain control circuit generating the constant voltage that is provided to the drain diffused region, based on forward voltage from the dummy diode.

3. The solid-state imaging device according to claim 1, the drain control circuit comprising a constant current source and generating the constant current that is provided to the drain diffused region.

4. The solid-state imaging device according to claim 1,

the drain control circuit including a capacitor, a power source that charges the capacitor, and a switch connecting one terminal of the capacitor to either of an output terminal of the power source for charging and the drain diffused region;

the drain control circuit connecting one terminal of the capacitor to the output terminal of the power source for charging so as to charge the capacitor during a period other than a predetermined period when the junction region between the semiconductor substrate and the semiconductor layer is forward biased; and

the drain control circuit connecting the one terminal of the capacitor to the drain diffused region so as to generate the constant charges that are provided to the drain diffused region, during the predetermined period.

5. The solid-state imaging device according to claim 1, a state where a predetermined amount of the charges of a given conductivity type are accumulated being a saturated state where a maximum amount of available charges of a given conductivity type are accumulated in the accumulation region.

6. The solid-state imaging device according to claim 1, the charges of the given conductivity type being holes if the first conductivity type is a P type and the second conductivity type is an N type.

7. The solid-state imaging device according to claim 1, the charges of the given conductivity type being electrons if the first conductivity type is an N type and the second conductivity type is a P type.